BOTMIND FRONTEND DEVELOPER TECHNICAL CHALLENGE

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MAP VIEW FOR A FLEET OF ROBOTS IN A SCHOOL CAMPUS

In this challenge, you are required to create a simple web application that contains a map view to display a fleet of robots. Feel free to use any JavaScript framework and libraries that you are familiar with.

Introduction

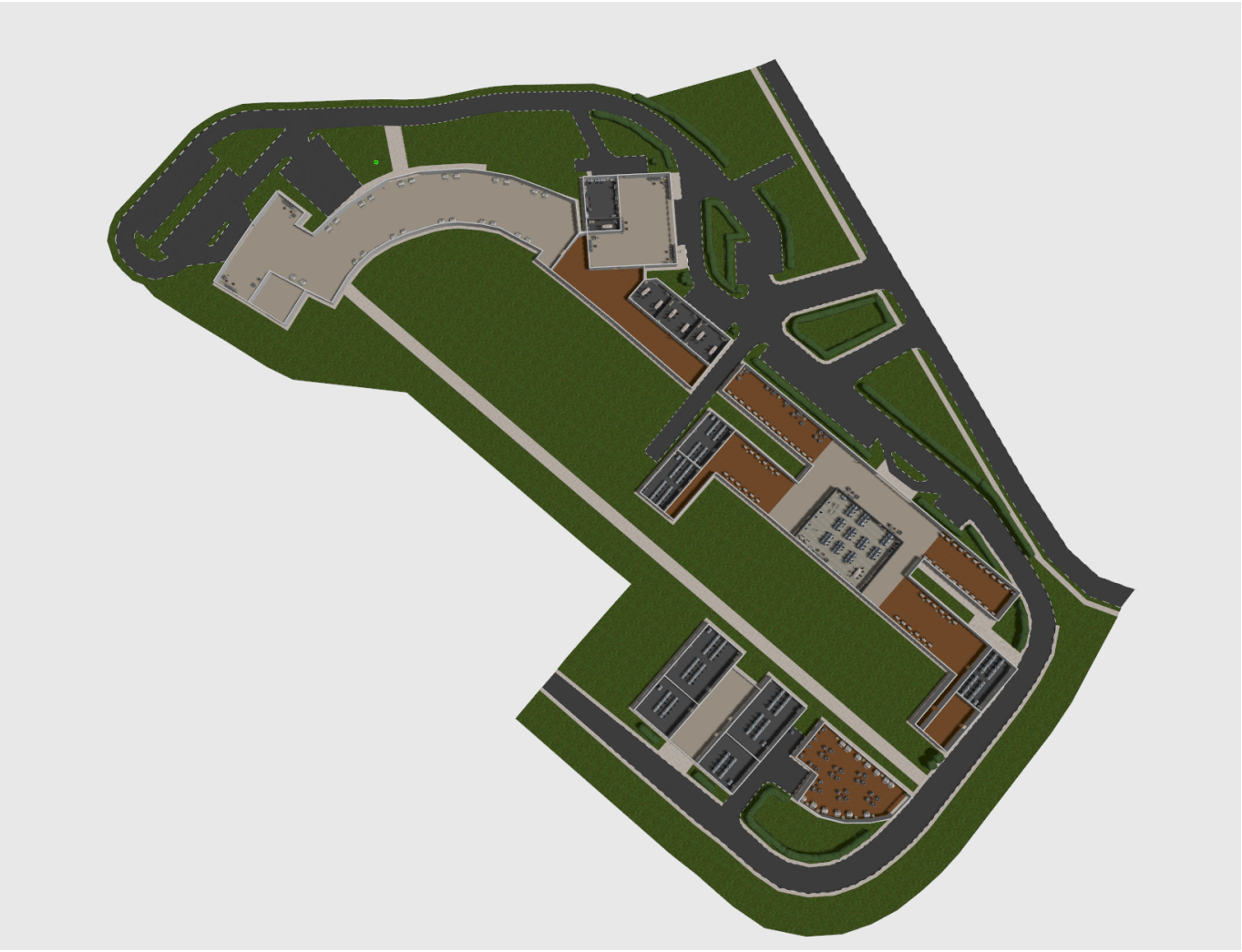
An autonomous mobile robot (AMR) is a self-navigating robot designed to operate in various environments without constant human intervention. Equipped with sensors, actuators, and onboard intelligence, these robots can perceive their surroundings, process information, and execute tasks autonomously.

AMRs employ a combination of sensor data, algorithms, and mapping techniques to navigate and localize themselves. Through Simultaneous Localization and Mapping (SLAM), AMRs generate maps of unknown environments while simultaneously estimating their own position within those environments.

Typically, AMRs use a Local Coordinate System, also known as the Robot Coordinate System, to represent the environment during mapping and localization processes. Contrary to the Global Coordinate System commonly employed in GPS and map applications like Google Maps, the Local Coordinate System is specific to the robot's immediate surroundings. Essentially, the Local Coordinate System delineates only a limited area within the robot's operational range.

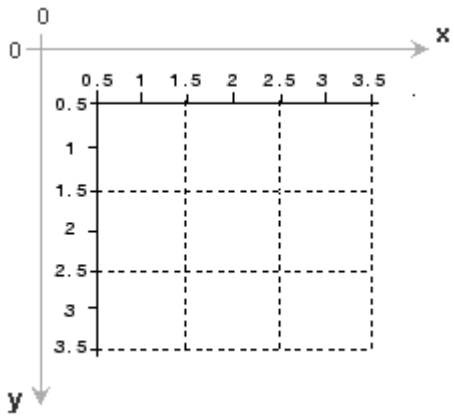
Local Coordinate System (School Campus)

Here is the map file (in local coordinate) for a school campus in Singapore:



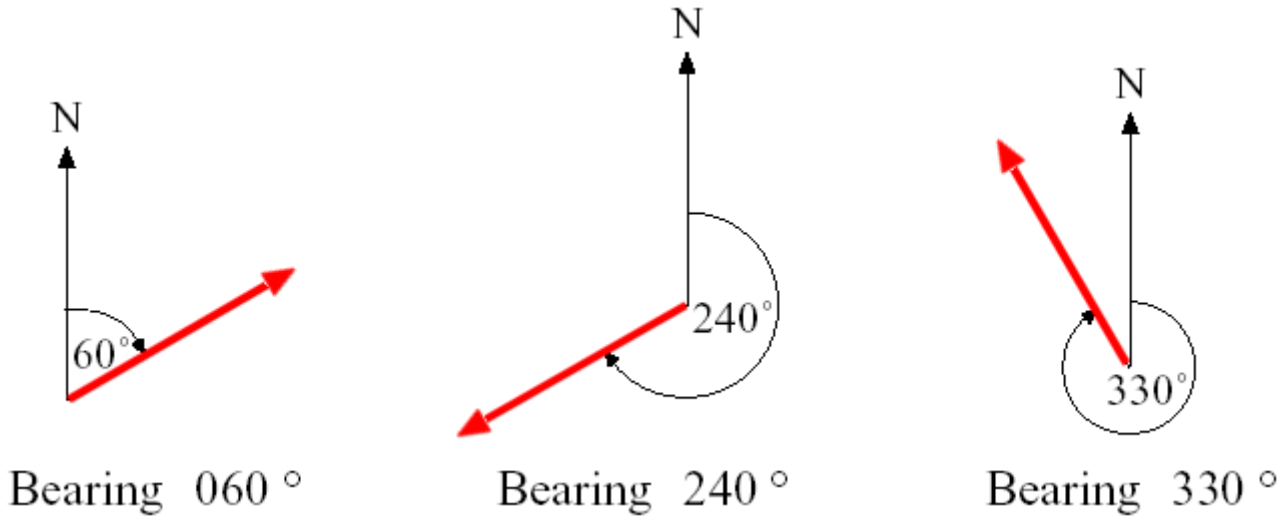
`Refer to robot_map/campus_sim.png for the actual file`

By now, you would have noticed the map file is actually an image in PNG format. For simplicity, we will assume that local coordinate is the same with **pixel coordinate**.



`Top left: (X: 0, Y: 0) | Bottom Right: (X: {image width}, Y: {image height})`

For the **heading**, the format is azimuth in degree.



`0 degree is referring to local map's north.`

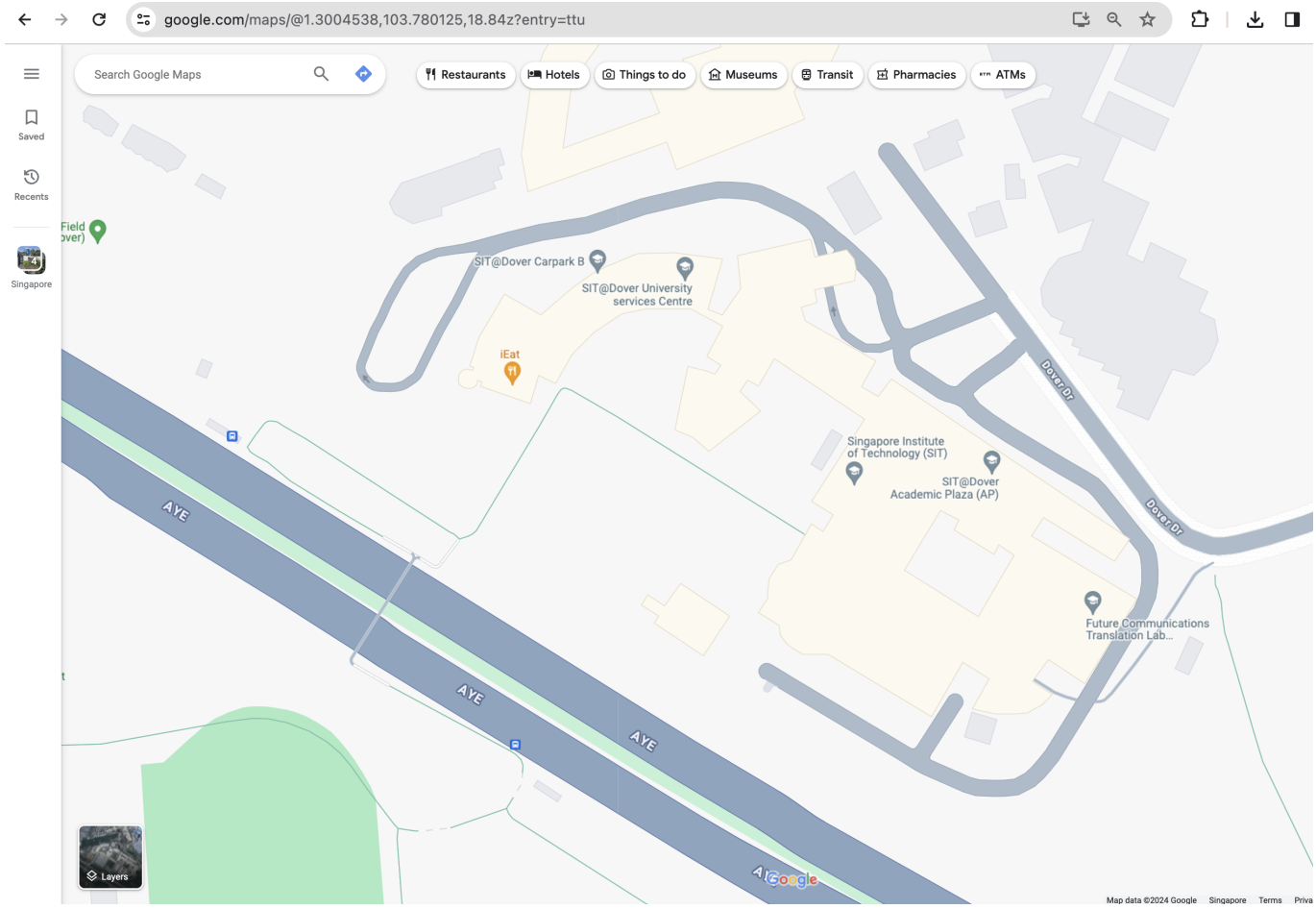
Fleet of robots and their respective position and heading in Local Coordinate

Based on the school campus robot map, here's the following information for the robots:

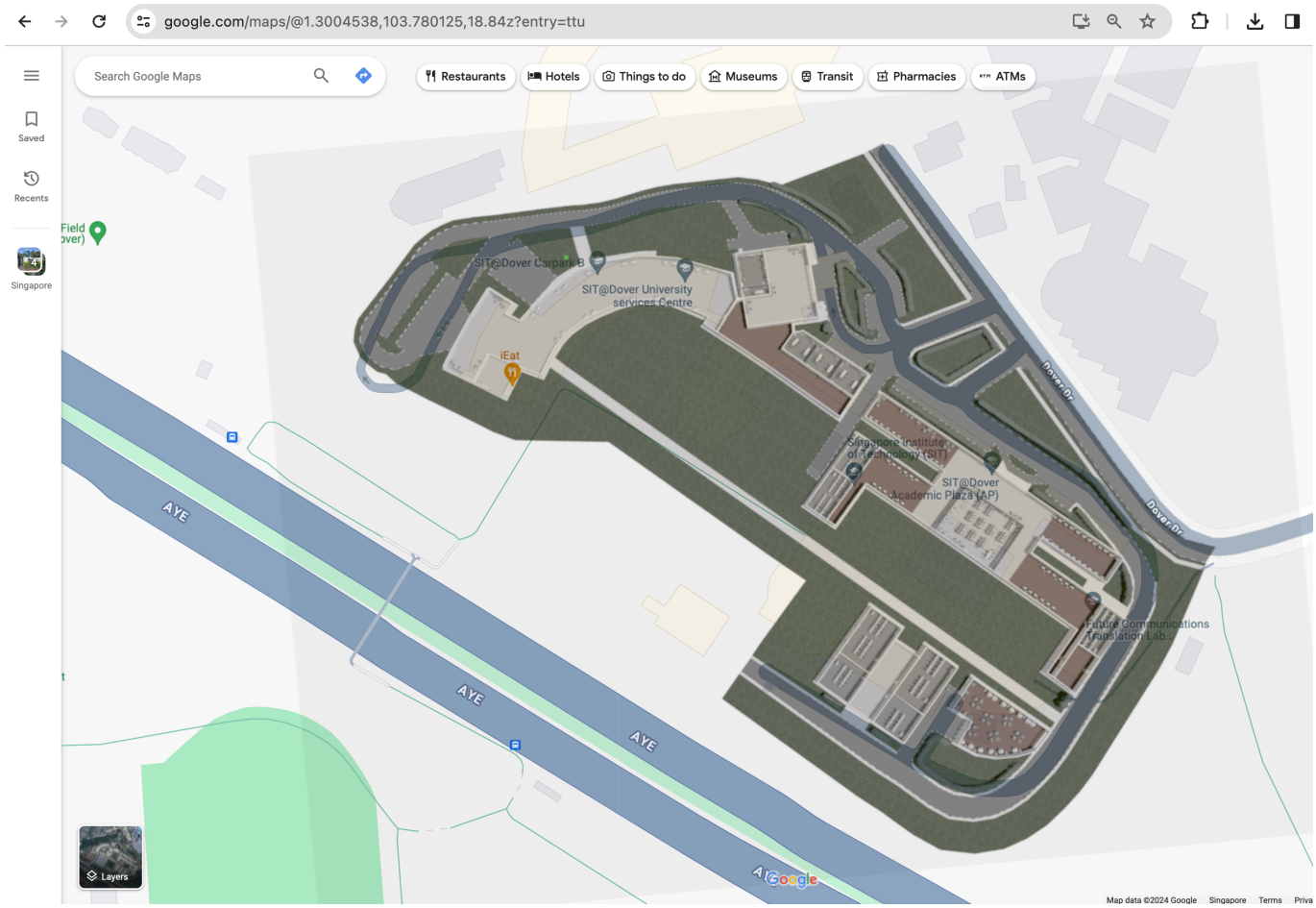
1. Robot 001 (X: 406, Y: 334, Heading: 0)
2. Robot 002 (X: 1101, Y: 613, Heading: 60)
3. Robot 003 (X: 922, Y: 946, Heading: 240)
4. Robot 004 (X: 863, Y: 324, Heading: 330)

Translation from Local to Global Coordinate System

Here is the example screenshot captures using Google Map (search "SIT@Dover Academic Plaza (AP)").



By now, you would have noticed the robot map actually corresponds to this global map area.



In your application, you are expected to develop function to translate local coordinate to global coordinate.

In your own implementation, please feel free to choose your own map library.

Features

(Mandatory)

- Track and monitor the positions (including headings) of all robots in your fleet directly within the map view.
- Display robot's map (local coordinate) on the map view (global coordinate).

(Optional)

- Display area size for the robot map.
- Display perimeter for the robot map.

`Feel free to propose features that are useful for good user experience.`

Submission

Please submit the followings inside a zip file:

1. Source code
2. Clear instruction to run the application (localhost)
3. Any documentations to explain your design and implementation process.